Original Research Article

Study the role of coagulation markers to evaluate the morbidity and mortality of snake bite victims

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Abstract

Background: Snake bite is a common acute medical emergency faced by rural populations in tropical and subtropical countries. In India, a large proportion of snake bites occur when people are working barefoot in the fields or while walking at night. More than 2,000 species of snakes are known worldwide, of which around 400 are poisonous. These snakes belong to the families Elapidae, Viperidae, Hydrophiidae and Colubridae **Aim and Objective:** 1. To study the role of coagulation markers to evaluate the morbidity and mortality of snake bite victims.2. Study the haematological profile and outcome in snake bite patients. **Methods:** A hospital based prospective study. **Study setting:** Pathology Department of Sub district hospital Sawantwadi dist.Sindhudurgh **Study duration:** 3 months (March 2023 to May 2023).**Study population:** All patients admitted in Sub district hospital Sawantwadi with history of snake bite .**Sample size: 50 Result:** Maximum of cases found in the age group of 31-40 years e.g 12 (24%), followed by 41-50 years age group 10 (20%), >60 years group 10 (20%), 51-60 years age group 8 (16%), 21-30 age group 7 (14%) and 3 cases in 13-20 age group. Most of patients with history of snake bite were males contributing 32 (64%) Snake bites were more common in males as compared to females 18 (36%). 18% snake bite patients have APTT > 30 seconds ,18% of victims had PT> 15 sec, 34% had platelet count <100000, Increased leucocyte count > 11000 was seen in 44% patients and 44% victims showed WBCT>20 minutes. Survival rate of snake bite cases was 96 %. Mortality rate of snake victims was 4%. Association between Prothrombin time and mortality among snake bite patients was statistically significant. **Conclusions:** Association between Prothrombin time and mortality among snake bite patients was statistically significant.

Keywords: Prothrombin time, APTT, Vasculotoxic, Neurotoxic, Coagulation markers

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INTRODUCTION

Snake bite is a common acute medical emergency faced by rural populations in tropical and subtropical countries. In India, a large proportion of snake bites occur when people are working barefoot in the fields or while walking at night.[1] More than 2,000 species of snakes are known worldwide, of which around 400 are poisonous. These snakes belong to the families Elapidae, Viperidae, Hydrophiidae and Colubridae.[2,3] Viper bites are more common than other poisonous snakebites in human beings.[4,5] Among different types of vipers, the Russell's viper (Vipera russelli) is inhabitant in South Asian countries. Russell's viper's bite is regarded as an occupational hazard for the farming community. India has over 250 species and subspecies, out of which 50 are poisonous.[2] There are approximately 1.2 million- 5.5 million snakebite worldwide each year, with 0.4-1.84

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million envenomation and 20,000-94,000 deaths.[1,6,7] Snake venoms are extremely complex substances. It contains proteic and non-proteic fractions which may produce local changes, like acute inflammatory activity, edema, ecchymosis, blisters and necrosis. Various systemic changes, such as hemorrhage, blood pressure alteration, neurotoxicity, hemolysis, rhabdomyolysis and acute kidney injury are also observed.[8] Venomous snake bites can be presented with local or systemic features of envenoming-neurological, haematotoxicities, myotoxicities, organ failure and some nonspecific features. Snakebite envenomation can present mainly as haemotoxicity or neurotoxicity. Haemotoxicity (prolonged whole blood clotting time/PT/APTT) can present as bleeding manifestations, capillary leak syndrome or disseminated intravascular coagulation (DIC) and acute renal failure.[9] There is also a wide variation in the composition of venom from species to species. This leads to a wide clinical diversity of ophitoxaemia. Ophitoxaemia causes increase in the permeability of capillary walls. This leads to blood loss and loss of plasma into the extra vascular space causing edema. This edema if severe leads to compromise of the blood circulation of that affected limb.[10,11] Bleeding and clotting disorders includes Traumatic bleeding from recent wounds, spontaneous systemic bleeding – from gums, epistaxis, bleeding into the tears, intracranial haemorrhage haemoptysis, haematemesis, bleeding into the mucosae skin and retina.[12] Coagulopathy is a common manifestation in some of these cases and its abnormality can be detected by blood coagulation tests.[13] There are very few references in the literature related to coagulation parameter abnormalities after snake bite. Therefore this study was undertaken to study hematological profile of snake bite cases.

PATHOGENESIS OF SNAKE BITE

Snake venoms contain hydrolases which produce bleeding at the local site, muscle or skin necrosis, and inflammation and coagulation derangement. The components of venom act at different steps of coagulation pathway by activating or inhibiting several molecular or cellular targets thereby inducing blood disorders.Treating a patient of snakebite need an understanding of the pharmacological effects of the different venom components. Thus, this review emphasizes the toxicological relevance of snake venoms mainly those of Viperidae and their components as pharmacological bioactive tools.

Coagulopathy after snake bite: The snake venom is a cocktail of various components such as enzymes, proteins, carbohydrates, lipids, non-toxic proteins, nucleotides, biogenic amines and nucleotides. There is also a wide variation in the composition of venom from species to species. This leads to a wide clinical diversity of ophitoxaemia. Ophitoxaemia causes increase in the permeability of capillary walls. This leads to blood loss and loss of plasma into the extra vascular space causing edema. This edema if severe leads to compromise of the blood circulation of that affected limb.

Hemorrhage: Hemorrhagins are responsible for systemic bleeding manifestations that occur in snake bitten individuals mainly by damaging vascular endothelium.Other effects caused by snake envenomation (coagulopathies, hemorrhage, impaired and few platelets, and vessel wall damage) can result in massive bleeding and this bleeding is a common cause of death after bites by Viperidae, Elapidae and Colubridae.

Picture 1: Cobra

Picture 2: Russell viper

Picture 3: Common krait

Picture 4: saw-scaled viper

AIM AND OBJECTIVE

1. To study the role of coagulation markers to evaluate the morbidity and mortality of snake bite victims.
2. Study the haematological profile and outcome in snake bite patients.

METHODOLOGY

Study design: A Hospital based prospective study
Study setting: Sub District hospital Sawantwadi dist.Sindhudurgh
Study population: Patients admitted in Sub District hospital with history of snake bite
Study period: 3 months (March 2023 to May 2023)
Sample size: **50**
Sampling method: Consecutive sampling method till desired sample size was achieved.

INCLUSION CRITERIA:

- Patients admitted in Sub District hospital Sawantwadi dist.Sindhudurgh with history of snake bite.

EXCLUSION CRITERIA:

1. Patients with unknown bite.
2. Pregnant female.
3. Paediatric age group
4. Patients with known case of bleeding disorder, liver diseases and patients on anticoagulants.

INVESTIGATIONS

Under all aseptic precautions, blood samples were collected in citrate bulb and EDTAbulb. For all the cases routine hematological studies and coagulation studies. investigations like haemoglobin, total and differential count of WBC platelet count, BT, CT, PT, APTT, 20WBCT, and other all routine investigation were done.

Procedure

Record based Data was collected for 50 patients, A total of 50 cases. Predesigned and pretested proforma was used as tool for data collection. Written consent was taken before the collection of data. Clinical data including age sex and occupation of the victims, the site of bite, time of bite, time between bite and presentation, clinical manifestations, complications and outcome were recorded. Detailed history, physical examination of patients, examination for various signs of bleeding from the site of bite, oral cavity, epistaxis and petechiae. Blood was drawn by a 23 guage needle with syringe into K3EDTA and 3.2% sodium citrate vacutainers. The plasma was then aliquoted in ependoff tubes. The sample was analysed for complete blood counts and coagulation studies PT, APTT on admission and after 12 hours of admission. The patients were followed up for 24 hrs.PT and APTT was performed on these patientsafter 24 hrs of admission.

Data analysis

All the data collected was entered in Microsoft excel software. Descriptive statistics like mean, ratio and proportions were calculated using microsoft excel software.
Association between sociodemographic factors and snake bite was studied with Fishers exact test. P< 0.05 was considered statistically significant.

C Image: Coagulomete

RESULT AND OBSERVATIONS

In Most of the snake bite cases biting species was unidentified. While among identified species Russell viper contributed 11 followed by cobra 09 and common krait 10 and saw scaled viper 20 cases. Majority of bite patients showed vasculotoxic manifaestations (62%) attributable to viperine bites. (38%) snake bite victims showed neuroparalytic manifaestations can be atributable to cobra and common krait bites.

Table 1: Distribution of cases according to age

Age in years	Frequency	Percentage
13- 20	03	6%
21- 30	07	14%
31- 40	12	24%
41- 50	10	20%
51- 60	08	16%
> 60	10	20%
Total	50	50 (100%)

The above table shows majority of cases found in the age group of 31-40 years e.g 12 (24%), followed by 41-50 years age group 10 (20%), >60 years group 10 (20%), 51-60 years age group 8 (16%), 21-30 age group 7 (14%) and 3 cases in 13-20 age group.

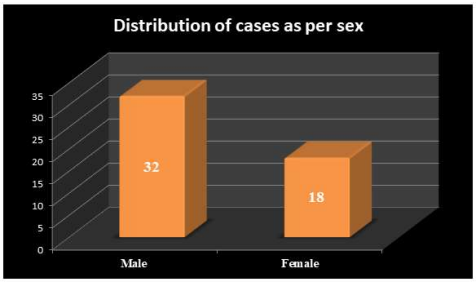

Figure 1: Distribution of cases as per sex

The Above Figure Shows Majority of Patients with History of Snake Bite Were MalesContributing 32 (64%) Snake Bites Were More Common in Males As Compared To Females 18 (36%).

Table 3: Hematological Profile of Study Subjects

Hematological parameter	Frequency	Percentage
Hemoglobin (Hb in gms)< 10 gm%	10	20%
Total count >11000	22	44%
Platelet count<100000	17	34%
Prothrombin time(in sec) >15 sec	09	18%
APTT In sec > 30 sec	09	18%
WBCT> 20 Minutes	22	44%

Above Table Shows That 18% Snake Bite Patients Have Aptt > 30 Seconds ,18% of Snake Bite Victims had Pt> 15 Sec, 34% had Platelet Count <100000, Increased Leucocyte Count > 11000 was Seen In 44% Patients And 44%Victims Showed WBCT>20 Minutes.

Table 4: Final outcome among hospitalized snake bite cases

Outcome	Frequency	Percentage
Discharged	48	96%
Death	02	4%
Total	**50**	**100**

The Above Shows Survival Rate of Snake Bite Cases Was 96 %. Mortality Rate of Snake Victims Was 4%.

Table 5: Association Between Prothrombin Time and Mortality Among Snake Bite Patients

Prothrombin Time	Total cases	Death	Discharged
Prolonged	09	02	07
Normal	41	0	41

The Fishers exact test statistic value is 0.0415. The result is significant at p<0.5.

DISCUSSION

This prospective study was done among 50 victims of snake bite in Sub District Hospital Sawantwadi. Aim of the study was to study role of coagulation markers in morbidity and mortality among snake bite victims. In current study majority of cases found in the age group of 31-40 years e.g 12 (24%), followed by 41-50 years age group 10 (20%), >60 years group 10 (20%), 51-60 years age group 8 (16%), 21-30 age group 7 (14%) and 3 cases in 13-20 age group. These findings are consistent with the findings of study by Kiran Nagaraju , Nagappan Kannappan and K. Gopinath[11] in this study it was observed that most common age group among snake bite victims was 30-50 contributing 52.6%. This Study Majority of Patients with History of Snake Bite Were Males Contributing 32 (64%) Snake Bites Were More Common in Males as Compared to Females 18 (36%). This Findings Are Similar with the Study by Halesha Br *et al.*[12] In which Predominant Snake Bite Victims Were Males Contributing 60.5%, Male to Female Ration Was 1.5:1.

In Most of the snake bite cases biting species was unidentified. While among identified species Russell viper contributed 11 followed by cobra 09 and common krait 10 and saw scaled viper 20 cases. A similar study done by Kulkarni *et al.*[13] it was concluded that biting species was identified in only 388 cases (61.2%). The commonest was viper (242 cases-38.2%) followed by cobra (129 cases-20.3%), water snake (10 cases) and krait (7 cases). These findings are similar to present study.

Majority of bite patients showed vasculotoxic manifaestations (62%) attributable to viperine bites. (38%) snake bite victims showed neuroparalytic manifaestations can be atributable to cobra and common krait bites. A study by Halesha BR *et al.*[12] revealed similar findings in which most of the snakebites were haematotoxic (60%), followed by neuroparalytic (40%). Hospital incidence of vasculotoxic snake bites in this study was 62%. Incidence of neuroparalytic snake bites was 38%. A similar study in Maharashtra by Sharma BD[14] showed similar results.

In current study 18% snake bite patients have APTT > 30 seconds ,18% of snake bite victims had PT> 15 sec, 34% had platelet count <100000, Increased leucocyte count > 11000 was seen in 44% patients and 44%victims showed WBCT>20 minutes. Similar results were seen in study by Harshwardhana HS in which it was observed that 13 patients (26%) had Hemoglobin less than 10 gm% and 32 patients (64%) had total leucocyte count more than 11,000. 24 patients (48%) had platelet count less than 1,00,000. 28 patients (56%) had prothrombin time more than 15 seconds. 31 patients (62%) had activated partial thromboplastin time more than 30 seconds. 24 patients (48%) had INR more than 1.5. FDP was positive in 22 patients (44%). WBCT was more than 20 minutes in 30 patients. These findings are consistent with present study.

In current study Final outcome of hospitalized snake bite victims was studied Survival rate of snake bite cases was 96 %. Mortality rate of snake victims was 4%. A similar study by Harshwardhana HS *et al.*[5] observed mortality rate of 4%. In current study Out of 50 cases 2 patients

died (4%) due to coagulopathy. There was statistical significant association between prolonged PT at admission and mortality among snake bite patients p value was < 0.05. A study by Shubham Agrawal *et al.*[13] concluded that PT, APTT, Fibronogen and thrombin should be considered as first line of investigations for any suspected coagulation abnormality in snake bite patients. PT and APTT were the first abnormal test result after snake envenomation. 12 hr so bservation was the safe period to rule out any complications following envenomation.

CONCLUSIONS

First line of coagulation markers PT, APTT should be considered as first line of investigations for any suspected coagulation abnormality in snake bite patients. If there is any abnormality in the first line parameters, then second line of specific markers can be entertained if required, to pinpoint the level of defect. PT and APTT were the first abnormal test result after snake envenomation. 12hrs observation was the safe period to rule out any complications following envenomation.

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